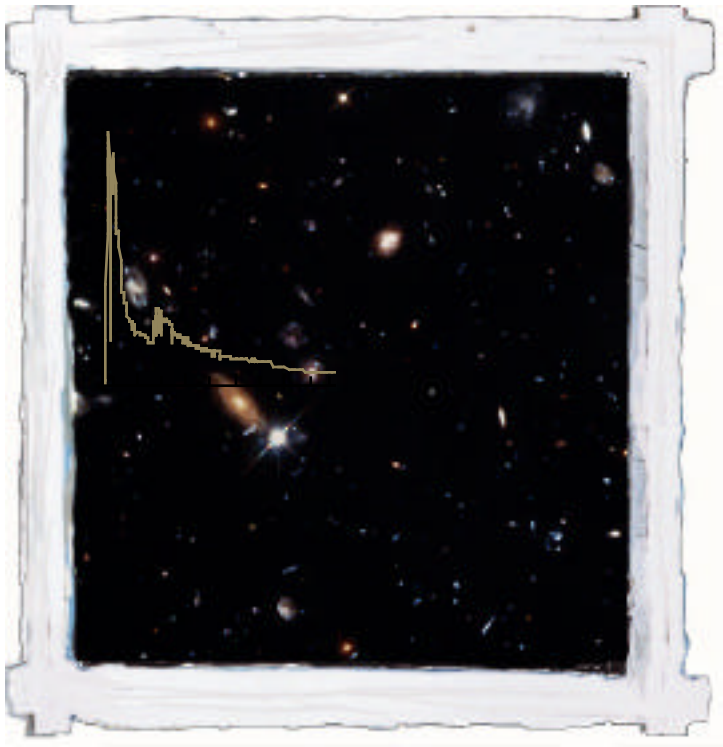
ORIGINS / NGST



THE NEXT GENERATION SPACE TELESCOPE

"Visiting a Time When Galaxies Were Young"
-from HST and Beyond, AURA

Technology Development Overview
NGST Quarterly

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Project Technologist & Technology Development IPT Lead
October 9, 1997

GSFC

Technology Development IPT Goals & Objectives

NGST

Goals

- **To provide the NGST project with access to an adequate technology base to enable-**

  (1) development of an exciting, viable mission concept within the programmatic limits established for science return, cost, schedule and risk

  (2) design, manufacture, launch and operation of a successful mission in a timely and cost effective manner

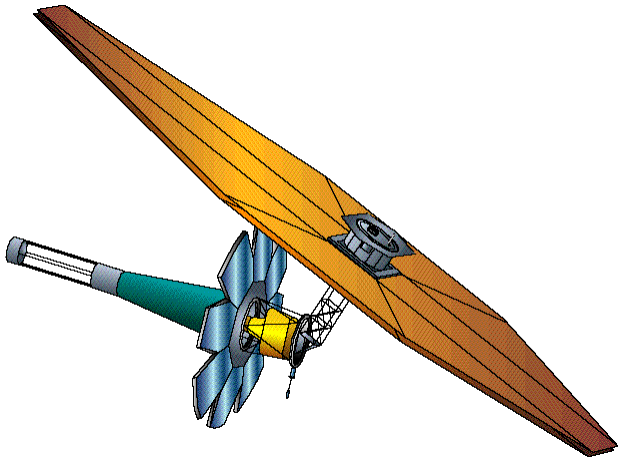
Objectives

- **Identify and prioritize NGST mission technology needs**
- **Plan, implement and manage technology development and validation for NGST within the available resources**
- **Aggressively promote development and implementation of high payoff technologies contributing to the success of NGST and enabling large space optical systems for future NASA missions**

NGST Key Technologies

NGST

- Low Vibration Long Life Cryogenic Coolers
- Large, Lightweight Cryogenic Optics
- Deployable Structures
- Wavefront Sensing & Control
- Passive Cooling
- Low Noise Large Format IR Detectors
- Autonomous Operations
- Integrated Optical/Mechanical/ Thermal/Control Modeling
- Vibration Control & Fine guidance/pointing



- *Lightweight Cryogenic Primary Mirrors- ≤15kg/m², DL@2μm, ≥2m diameter*
- *Cryogenic Actuators- T≤60K, Res ≤20nm, Stroke = 0.5-10mm, mass≤ 100gm, power diss≤5mwatts , zero hold power*
- *Cryogenic Deformable Mirror- T≤60K, Res ≤5nm, Stroke ≥1μm, actuator spacing ≤1mm, # of actuators≈1000*
- *Wavefront Sensing/Control & Fine Guidance/Pointing Methodology-image based wavefront sensors, co-alignment/co-phasing algorithms, jitter control-fast steering mirrors*
- *Precision Deployable Structures- primary mirror, secondary mirror, spacecraft isolation truss; accuracy=25μm-1mm, stability=TBD*
- *Vibration Control Methodology- passive damping, active isolation ,0.1-3Hz*
- *Large Format, Low Noise IR Arrays- 4kx4k (NIR), 1kx1k(FIR), dark current= 0.02-1e/sec, read noise ≤15e/sec*
- *Vibrationless, Long Life Cryocoolers- T=30K and 7K, cooling power=mwatts*
- *Lightweight Sunshade- deployable or inflatable, 10mx30m, enable telescope to cool to T<60K, low volume, mass≤100kg, space durable*
- *Autonomous Operations Methodology- Adaptive Scheduler, flight software tools, Expert Assistant (proposal preperation, observation planning)*

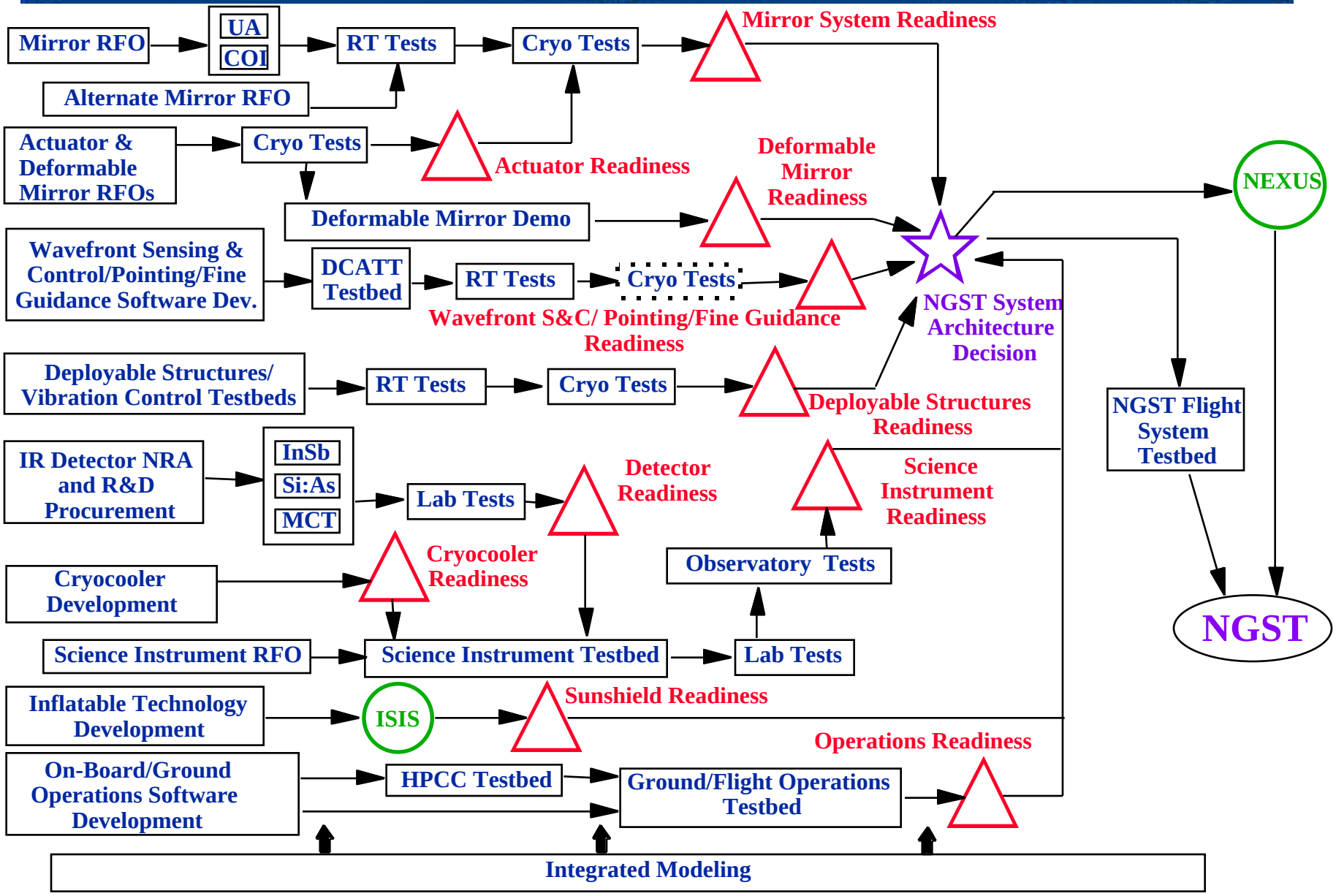
NGST Technology Development Activities

NGST

- *Lightweight Cryogenic Primary Mirrors- Optics RFOs (MSFC)*
- *Cryogenic Actuators- Actuator RFO (LaRC, JPL- test facility)*
- *Cryogenic Deformable Mirror- Actuator and DM RFOs (LaRC,MSFC)*
- *Wavefront Sensing/Control & Fine Guidance/Pointing Methodology- DCATT Testbed (GSFC, JPL, MSFC) & Architecture Contractors*
- *Precision Deployable Structures- Architecture Contractors*
- *Vibration Control Methodology- Space Interferometry Mission & Architecture Contractors*
- *Large Format, Low Noise IR Arrays- IR Detector NRA (ARC)*
- *Vibrationless, Long Life Cryocoolers- NASA Technology Program (GSFC, JPL)*
- *Lightweight Sunshade- NASA Technology Program (JPL, GSFC) & Architecture Contractors*
- *Autonomous Operations Methodology- GSFC Program*

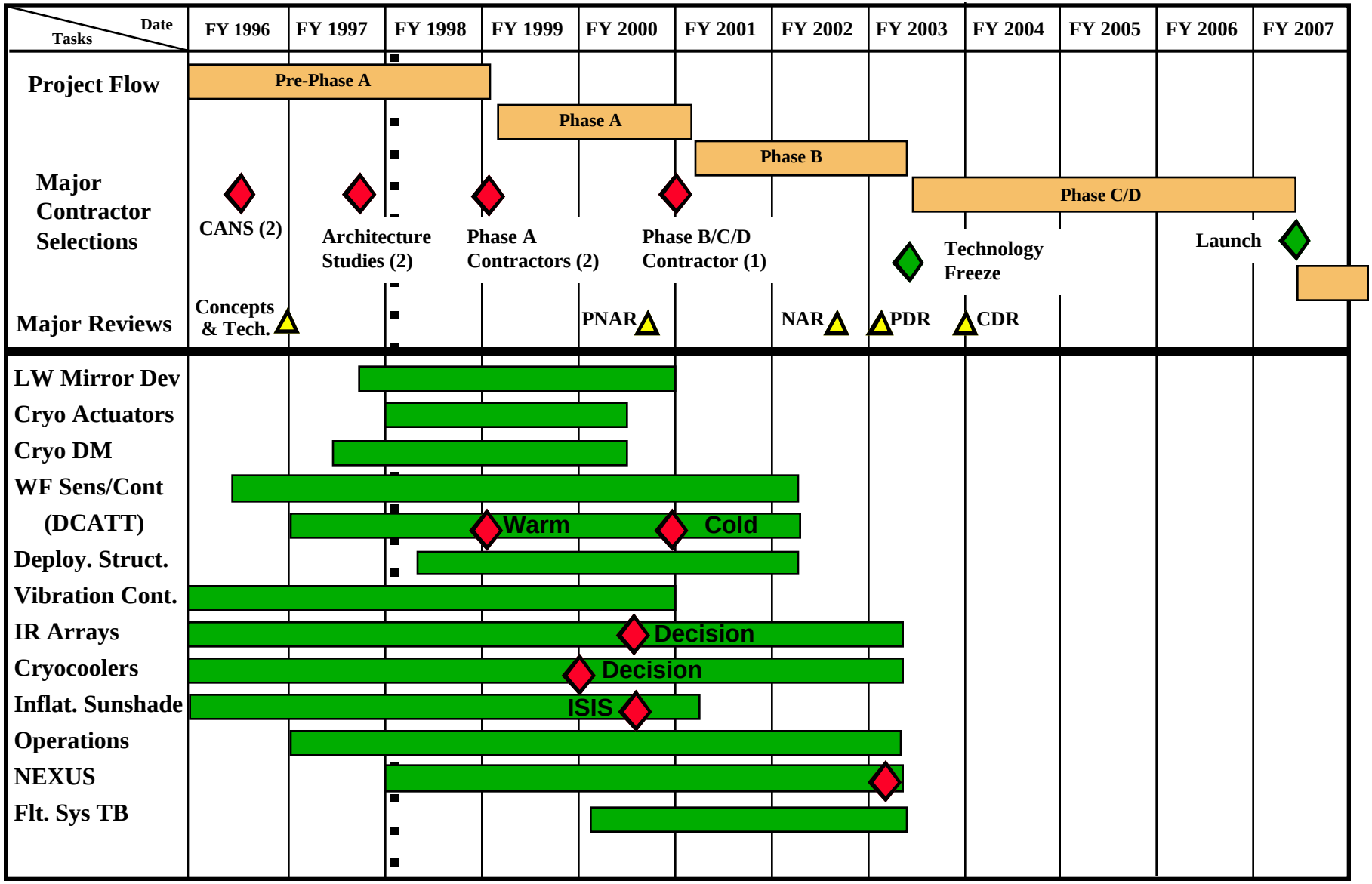
Technology Development Roadmap

NGST



Technology Development Schedule

NGST



Review of Planned Activities from June Quarterly

NGST

- **Award Lightweight Mirror System Demonstrator Contracts (MSFC)(accomplished)**
- **Complete detailed NGST FY'98 Technology Development Plan & Budget (All)(accomplished)**
- **Complete and publish final NGST Technology Implementation Plan and Brief Pete Ulrich and Rick Howard (JPL/All)(not accomplished)**
- **Complete and release Cryogenic Actuator RFO (LaRC/GSFC)(partially accomplished)**
- **Prepare and release IR Detector RFO (ARC) (change of plans)**
- **Complete Development of NGST Flight Experiment Strategy and brief to HQ and Architecture Study Award winners (GSFC)(partially accomplished)**
- **Brief HQ on NGST inflatable sunshade technology development plans in support of Pathfinder 1 flight in mid-'00 and initiate effort (JPL/GSFC) (accomplished)**
- **1st NGST Technology Challenge Review (All)(accomplished)**
  - **Prepare and implement proposal process for Technology Challenge Feasibility Grants (partially accomplished)**

Near Term Activities

NGST

- NGST Mirror System Demonstrator PDRs (MSFC)
- Exercise Architecture Study Option 2 Technology Development Efforts (GSFC)
- Complete and publish final NGST Technology Implementation Plan and Brief Pete Ulrich and Rick Howard (JPL/All)
- Release Cryogenic Actuator RFO, select winners and initiate work (LaRC)
- Prepare and release Be mirror RFO, select winners and initiate work (MSFC)
- Review and recommend Phase 2 SBIRs for funding (MSFC/All)
- Execute formal GSFC/JPL agreement on ISIS (GSFC,JPL)
- DCATT CDRs (GSFC,JPL,MSFC)
- Technical exchange meetings with European optics suppliers (GSFC,MSFC,JPL)